

0.51, or 0.61 below normal; the greatest monthly amount, 4.76, occurred at Isabella, while none fell at Cidra.

Four consecutive weeks of hot, dry weather have resulted in considerable damage to growing crops and the paralysis of all farm work except the cutting and grinding of cane, for which the conditions have been ideal. This work is now general and is being energetically pushed. The yield is good and the grade of juice slightly improved. The young canes on low lands continue to grow, but those on the hill sides are at a standstill for lack of rain. The tobacco crop has suffered the greatest material damage from the drought, and without rain in the near future much of this crop will certainly be lost. Coffee continues promising, but a continuation of the dry weather will be injurious, as many of the trees have arrived at the flowering stage. Small crops and vegetables continue plentiful, but pastures are rapidly drying up and stock is suffering accordingly.—*E. C. Thompson.*

South Carolina.—The mean temperature was 40.6°, or 5.4° below normal; the highest was 77°, at Conway on the 22d and at St. George on the 27th, and the lowest, 11°, at Barksdale on the 6th. The average precipitation was 5.89, or 1.20 above normal; the greatest monthly amount, 10.51, occurred at Barksdale, and the least, 2.38, at Yemassee.

Unfavorable weather prevailed over the western and northern portions, where wheat and oats were injured by winter killing, and little or no farm work was practicable. Over the southeastern portion the conditions were favorable for general farm work, but were too cool for rapid germination and growth. In this section some fruit trees began to bloom at the close of the month.—*J. W. Bauer.*

South Dakota.—The mean temperature was 17.7°, or 2.0° above normal; the highest was 65°, at Oelrichs on the 21st, and the lowest, 30° below zero, at Mitchell on the 4th. The average precipitation was 0.53, or 0.03 above normal; the greatest monthly amount, 2.30, occurred at Fort Meade, and the least, trace, at Cherry Creek and Silver City.

The weather during the first decade was cold, with temperature considerably below normal much of the time, being a continuation of the cold period which set in on January 25. During the second and third decades it was much milder, with temperature generally above normal. Snow, with high northwest wind, fell over much of the State during the night of the 27th and on the 28th, in some localities being the most disagreeable storm of the winter, but the temperature was not low. There was some local loss of young, unprotected cattle reported on the ranges west of the Missouri River, due to cold weather and to interruption by snow to steady grazing. A little field work, such as clearing of ground and dragging, was done during the latter part of the month.—*S. W. Glenn.*

Tennessee.—The mean temperature was 32.7°, or 6.8° below normal; the highest was 68°, at Palmetto on the 27th, and the lowest, 1° below zero, at Silver Lake on the 14th. The average precipitation was 3.41, or 1.11 below normal; the greatest monthly amount, 6.72, occurred at Isabella, and the least, 1.68, at Wildersville.

The month was very unfavorable for winter grain. Continuous freezes and low temperature caused the poorest prospect for many years; many fields look entirely bare, and will be plowed up and planted in spring crops. The snowfall about the middle of the month afforded some protection, but came almost too late. At the end of the month, early drilled wheat was the most promising, while late sowings were in bad condition. Oats were mostly winter killed.—*H. C. Bate.*

Texas.—The mean temperature was 48.9°, or 1.5° below normal; the highest was 104°, at Fort Ringgold on the 26th, and the lowest, 1°, at Tulla on the 2d. The average precipitation was 1.05, or 0.74 below normal; the greatest monthly amount, 3.86, occurred at Houston, while none fell at Fort Ringgold, Kent, Wichita Falls, and Sanderson.

The month was without special phenomena other than severe sandstorms in the western sections during the latter part of the month. Moderate rains fell in the eastern and coast districts; elsewhere the drought has continued with increased severity. The condition of wheat was somewhat improved in the central and southern portions of the wheat belt, but continues very unsatisfactory over the northern portions. Spring oats are being seeded; corn planting has become general in the southern portion and has begun in the central section; the crops need

heavy rains. Preparation of land for cotton is well advanced, except where the ground is too hard and dry to plow. The first shipments of strawberries have been made, and shipments of other vegetables have been large throughout the month.—*Edward H. Bowie.*

Utah.—The mean temperature was 34.1°, or 5.3° above normal; the highest was 74°, at St. George on the 17th, and the lowest, 20° below zero, at Loa on the 2d. The average precipitation was 0.87, or 0.35 below normal; the greatest monthly amount, 2.54, occurred at Ranch, and the least, trace, at Emery and Terrace.

The month was the warmest February since 1886. Fall grain improved and is now generally in good condition. Peach buds have been damaged in Weber County, but elsewhere all fruit buds are still in good condition.—*L. H. Murdoch.*

Virginia.—The mean temperature was 31.2°, or 6.2° below normal; the highest was 72°, at Barboursville on the 22d, and the lowest, zero, at Burkes Garden on the 5th. The average precipitation was 4.77, or 1.40 above normal; the greatest monthly amount, 7.32, occurred at Roanoke, and the least, 2.20, at Stanardsville.

Crop growth was much retarded by the generally cold weather prevailing. Snow protection caused some local improvement, but outlook poor at close of month. The early seeded winter wheat which has formed the best portion of this year's prospective crop, was further injured. Winter oats and clover have also suffered severely.—*Edward A. Evans.*

Washington.—The mean temperature was 39.2°, or 3.1° above normal; the highest was 74°, at Pasco on the 15th, and the lowest, 18° below zero, at Hooper on the 1st. The average precipitation was 6.89, or 2.49 above normal; the greatest monthly amount, 26.63, occurred at Brinnon, and the least, 1.29, at Dayton.

The month was mild and open, and therefore favorable for winter wheat and the pastures of the western section. Much damage was done to wheat by the cold snap of the last week of January. About half will have to be resown; the remainder is not considered especially strong and healthy. Spring plowing and seeding have begun.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 26.7°, or 4.9° below normal; the highest was 68°, at Byrne on the 28th, and the lowest, 11° below zero, at Buckhannon on the 14th. The average precipitation was 3.20, or 0.15 below normal; the greatest monthly amount, 5.65, occurred at Byrne, and the least, 1.33, at Moscow.

From the 1st to 23d the ground was covered with sleet, ice, and snow; the depth of snow was sufficient to afford ample protection to wheat, rye, and oats, but the effect of sleet and deep freezing upon these crops is doubtful, and it is feared considerable damage was done in some counties. Farm work was absolutely suspended; orchards were considerably damaged by sleet, and peaches are thought to be killed in some localities.—*E. C. Vose.*

Wisconsin.—The mean temperature was 17.1°, or 0.8° above normal; the highest was 62°, at Knapp on the 27th, and the lowest, 30° below zero, at Osceola on the 2d. The average precipitation was 1.30, or about normal; the greatest monthly amount, 2.30, occurred at Port Washington, and the least, 0.22, at Hayward.

The weather during the month was very favorable to winter grains and grass; winter wheat shows good vitality and clover appears to be in good condition; there is but little frost in the ground in the southern counties and it is rapidly disappearing elsewhere; no farm work done.—*W. M. Wilson.*

Wyoming.—The mean temperature was 29.2°, or 6.9° above normal; the highest was 70°, at Rock Springs on the 18th, and the lowest, 27° below zero, at Fort Laramie on the 2d. The average precipitation was 0.48, or 0.27 below normal; the greatest monthly amount, 1.58, occurred at Border, while none fell at Hyattville, and only traces at Alcova and Daniel.

The mild weather of the month was very favorable for the stock interests of the State, and stock continues in good condition. Snow in the mountains was materially increased during the month, especially over the headwaters of the Laramie and Platte rivers. The unusually mild weather allowed some plowing to be done in several sections of the State.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

GENERAL SUMMARY FOR FEBRUARY, 1902.

Temperature mean for the month, 69.5°; normal, 70.4°; average daily maximum, 76.1°; average daily minimum, 64.4°; mean daily range, 11.7°; greatest daily range, 24°; least daily range, 5°; highest temperature, 79°; lowest, 52°.

Barometer average, 30.000; normal, 29.960; highest, 30.22, on the 4th; lowest, 29.72, on the 14th; greatest 24-hour change, i. e., from any given hour on one day to the same hour on the

next, 0.27. Lows passed this point on the 14th and 22d; highs on the 4th, 16th, and 28th.

Relative humidity, 75 per cent; normal, 75; mean dew-point, 60.7°; normal, 62°; absolute moisture, 5.93 grains to the cubic foot; normal, 6.24. A most unusual drop of 20° in the dew-point took place from the 14th to the 15th.

Rainfall, 1.25 inch; normal, 5.70; rain record days, 12; normal, 16; greatest rainfall in one day, 0.44, on the 2d; total at Luakaha, 3.44; normal, 14.50; at Kapiolani Park, 0.27; normal, 5.20.

Rainfall data.

Stations.	Elevation.	Feb., 1902.	Stations.	Elevation.	Feb., 1902.
HAWAII.					
Hilo, e. and ne.	Feet.	Inches.	MAUI—Continued.		
Waialea	50	3.56	Paia, n.	180	2.76
Hilo (town)	100	2.92	Haleakala Ranch, n.	9,000	6.86
Kaunama	1,250	10.33	Wailuku, ne	200	2.54
Pepeekeo	100	4.07	Waiahoa	2,700	2.59
Hakalau	200		OAHU.		
Honohina	300		Punahou (W. B.), sw.	47	1.25
Laupahoehoe	500	9.89	Kulaokahua, sw.	50	1.22
Ookala	400		Makiki Reservoir	150	1.54
HAMAKUA, ne.			U. S. Naval Station, sw.	6	0.76
Kukalau	250	3.52	Kapiolani Park, sw.	10	0.27
Paauilo	750		Manoa (Woodlawn Dairy), c.	285	2.88
Paauhau (Mill)	300	2.84	School street (Bishop), sw.	50	1.49
Honokaa (Muir)	425	2.59	Pacific Heights, sw.	700	2.14
Kukuihaele	700	5.49	Insane Asylum, sw.	30	1.02
KOHALA, n.			Kamehameha School	75	0.94
Awini Ranch	1,100		Kalihi-Uka, sw.	260	2.60
Niuli	200	3.28	Nuuanu (W. W. Hall), sw.	50	1.49
Kohala (Mission)	521	3.89	Nuuanu (Wyllie street), sw.	250	2.14
Kohala (Sugar Co.),	235	2.27	Nuuanu (Elec. Station), sw.	405	
Hawi	300		Nuuanu (Luakaha), c.	850	3.45
Hawi Mill	600	3.97	Maunaloa, ne.	25	1.43
Waimea, e.	2,720	4.91	Maunawili, ne.	300	2.05
KONA, w.			Kaunoe, ne.	100	
Kailua	950	1.48	Ahuimanu, ne.	350	2.04
Holualoa	1,350	1.09	Kahuku, n.	25	3.34
Kealahakua	1,380	1.29	Wailua, n.	20	1.92
Napoopoo	25	0.47	Wailua, c.	900	
KAU, se.			Ewa Plantation, s.	60	0.64
Kahuku Ranch	1,680	1.04	Waipahu, s.	200	0.70
Waiohinu	1,000		Moanalua, sw.	15	1.13
Honua	15	0.55	Magnetic Station	50	0.68
Naalehu	650	0.59	KAUAI.		
Hilea	310	0.80	Lihue (Grove Farm), e.	200	3.78
Pahala	850		Lihue (Molokaa), e.	300	4.27
Moaula	1,700		Lihue (Kukaua), c.	1,000	6.39
PUNA, e.			Kealia, e.	15	4.26
Volcano House	4,000	2.16	Kilauea, ne.	325	7.70
Olaa			Hanalei, n.	10	12.24
Olaa (17-mile)	1,700	8.18	Haena	15	10.42
Kapoho	110		Waiawa, sw.	32	2.21
Kalapana, se.	8		Elele, s.	200	
MAUI.			Wahiawa Mountain, s.	2,100	
Lahaina, w.			McBryde (Residence)	850	8.21
Waipae Ranch, s.	700	0.46	Lanai	450	5.96
Kaupo (Mokulau), s.	285	2.84	Delayed January reports.		
Kipahulu, s.	300	1.89	Ewa Mill		0.10
Manoa Plantation, se.	60	1.42	Kipahulu		2.53
Nahiku, ne.	60		Wyllie Street		0.81
Nahiku (Nishwitz), ne.	800	12.60	Moaula		2.64
Haiku, n.	700	3.42	Pahala		2.80
Kula (Waikoa)	2,700	2.59	Hawi Mill		3.16
Kula (Erehwon), n.	4,500	3.64	Hilo Boarding School		2.40
Puuomalei, n.	1,400	5.12			

Water level in the artesian well fell slightly during the month from 33.95 to 33.80 feet above mean sea level. March 1, 1901, it stood at 34.37. The average daily mean sea level for the month was 9.89 feet on the scale, 10.00 representing the assumed annual mean.

Trade wind days, 6 (north-northeast one-half day); normal, 15; average force of wind (during daylight), Beaufort scale, 1.8; cloudiness, tenths of sky, 4.9; normal, tenths of sky, 4.4.

Approximate percentages of district rainfall as compared with normal: Hilo, 40; Hamakua, 40; Kohala, 85; Waimea, 107; Kona, 42; Kau, 25; Puna, (?); Olaa, 60; Maui, 110; Oahu, 25; Kauai, 90. January and February have both been dry months.

Mean temperatures: Pepeekeo, Hilo district, 100 feet elevation, average maximum, 78.4°; average minimum, 65.5°; Waimea, Hawaii, 2,730 elevation, 71.8° and 59.0°; Kohala, 521 elevation, 78.5° and 64.2°; Waiahoa, Kula, Maui, 2,700 elevation, 75.5° and 52.1°; Ewa Mill, 50 elevation, 78.4° and 62.4°; United States Magnetic Observatory, 80.5° and 62.0°; W. R. Castle, 60 feet elevation, highest, 78°; lowest, 53°; mean, 69.3°. (The mean monthly temperature is reckoned at this office as 0.7° lower than the mean of maximum and minimum.)

Mr. Fleming, at the Magnetic Observatory, reports the mean dew-point, 9 a. m., 60.5°; 9 p. m., 60.2°; relative humidity, 67.8 and 75.

Dr. B. D. Bond, at Kohala, reports mean dew-point, 59.4°; relative humidity, 72.7.

Ewa Plantation, mean dew-point, 61°; relative humidity, 72.5.

Strong north to northeast winds prevailed during the first seven days of the month; from the 7th to the 27th westerly winds were unusually persistent, with a decided cold wave the 16th and 20th, having a minimum of 51° at sea level. Newspaper reports give ice at 4,000 feet elevation. On the night of the 27th a northerly gale set in which continued into March.

It is probable that Hawaii was on the south side of a very extensive disturbance which produced the storms of the first days of March on the mainland.

Earthquakes on Hawaiian Islands: 9th, 6:25 p. m.; 20th, 5:30 a. m., at Waimea, Kohala, and Hilo.

OBSERVATIONS AT HONOLULU.

The station is at 21° 18' N., 157° 50' W.
Hawaiian standard time is 10^h 30^m slow of Greenwich time. Honolulu local mean time is 10^h 31^m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Meteorological Observations at Honolulu, February, 1902.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time.										Total rainfall at 9 a. m., local time.	
		Dry bulb.	Wet bulb.	Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.				
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.			
1	*	73	69	79	72	66.5	76								
2	30.07	73	69	77	72	66.0	78	ne.	4-2	8	30.11	29.95	0.00		
3	30.08	72	64	74	69	63.7	75	ne.	3-6	8-4	30.16	30.07	0.11		
4	30.15	70	64	75	70	60.0	68	ne.	6-4	5	30.17	30.07	0.44		
5	30.14	70	62.5	74	68	62.3	75	ene.	6-4	5	30.21	30.15	0.13		
6	30.08	69	62	74	68	59.5	79	ene.	6-4	8	30.22	30.12	0.05		
7	30.04	69	62.5	75	68	58.3	80	ne.	5	8	30.18	30.08	0.28		
8	30.05	62	60	77	67	59.7	70	ene-ne.	4	4	30.11	30.01	0.04		
9	29.97	59	57.5	76	61	59.0	76	sw-n.	3-0	1-0	30.08	29.99	0.00		
10	29.97	58	55.5	77	56.5	59.0	80	w.	1-0	0-6	30.09	29.97	0.00		
11	29.91	61	58.5	75	56	56.5	75	w-sw.	1-0	0	30.06	29.90	0.00		
12	29.89	71	68	76	58	60.5	75	w-sw.	1-0	0-10	29.95	29.86	0.01		
13	29.88	66	65	78	69	67.3	84	ws.	3-0	1-1	29.95	29.87	0.00		
14	29.79	73	67.5	78	64	66.5	82	sw.	3-4	4	29.94	29.79	0.00		
15	29.90	61	57	78	71	65.0	83	sw-w.	3-4	10-3	29.90	29.72	0.15		
16	30.05	54	52	72	59	51.0	63	n.	3-0	2	30.11	29.90	0.00		
17	30.03	64	61	76	62	65.3	72	n-sw.	1-0	0-8	30.12	30.02	0.00		
18	29.91	65	64	74	61	61.0	79	sw.	1-0	8	30.04	29.92	0.01		
19	29.98	54	52	76	63	56.5	68	sw.	4-2	6-0	30.04	29.90	0.00		
20	30.05	56	54.5	74	53	53.7	75	sw-n.	1-0	0	30.06	29.97	0.00		
21	30.00	62	60.5	74	54.5	55.7	75	n.	4-2	0	30.09	29.99	0.00		
22	29.91	70	65	77	58	60.5	72	sw-w.	3-1	1-8	30.02	29.91	0.00		
23	29.89	69	67	79	70	64.3	76	ws.	3-1	4	29.93	29.85	0.00		
24	29.91	72	67	78	66	66.7	80	sw.	3-0	7	29.98	29.86	0.00		
25	29.95	69	66.5	79	70	65.7	80	sw.	2	2-3	29.99	29.89	0.00		
26	29.96	70	67.5	79	66	63.5	75	w-n.	1-0	8-1	30.00	29.92	0.01		
27	29.96	67	65.5	78	65	65.7	84	sw-n.	1-0	8	30.01	29.93	0.01		
28	30.01	65	58.5	79	65	61.7	72	sw-n.	2-6	4	30.02	29.92	0.01		
29															
30															
31															
Sums														1.25	
Means	29.989	65.7	63.0	76.1	64.4	60.7	75.0	1.8			30.056	29.950			
Departure	+0.040					-1.3	0							-4.45	

Mean temperature for February, 1902, (6 + 2 + 9) ÷ 3 = 69.5; normal is 70.4. Mean pressure for February, 1902, (9 + 8) ÷ 2 = 30.000; normal is 29.960.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.
[For tables see page 108.]

Notes on the weather.—As is usual during February, the weather was fine on the Pacific slope until about the 22d, when the northers began to blow with unusual force, bringing occasional showers far down on the southern slope of the Cordilleras. In San Jose the rather heavy rainfall of the 24th, the heaviest experienced during February since 1888, was quite a